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**Discussion paper**

# Unemployment and labor market institutions; an empirical analysis

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## Abstract

The development of the unemployment rate differs substantially between OECD countries. In this paper we investigate to what extent these differences are related to labor market institutions. In our analysis we use data of eighteen OECD countries over the period 1960-1994 and show that the way in which institutions interact is important.

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# 1 Introduction

There are substantial differences in the development of the unemployment rate between OECD countries. Whereas from the 1960s to the early 1980s unemployment increased in every OECD country, since the early 1980s the development diverges. For some countries unemployment kept on rising, for other countries unemployment stabilized, while for again other countries unemployment went down substantially. Table 1 gives an overview of these long term developments in unemployment rates. It is shown that in the early 1960s unemployment rates varied from close to zero in Switzerland to 5.7% in the United States. In the early 1980s the spread in unemployment rates was much wider. Then, unemployment rates varied from 0.6% in Switzerland to 11.8% in Ireland. In the late 1990s the spread was smaller, mainly because of an increase in unemployment in countries that used to have a low unemployment rate. In the late 1990s unemployment rates varied from 3.7% in Japan to 13.4% in Finland. Developments are quite different between countries. Countries like Sweden and Switzerland have experienced a small increase in their unemployment rates in the first period and a larger increase in the second period. Countries like the Belgium, the UK, Denmark and the Netherlands have experienced a substantial increase in their unemployment in the first period, but a decline in the second period.

In this paper we focus on the relationship between unemployment and labor market institutions.<sup>1</sup> Labor market institutions interact with each other, i.e. the institutional framework of a country is not a set of independent elements. As Freeman (1998) stresses a particular institutional feature may perform differently depending on the overall institutional framework. The objective of this paper is to investigate the existence of interactions between institutions in more detail. We use a simple theoretical model that enables us to illustrate the mechanisms through which institutions interact and influence unemployment. We also investigate whether there is empirical evidence on the existence of complementarities. Studies that try to establish the effect on unemployment of institutions based on cross country analysis are usually somewhat limited for two reasons. First, institutions do not change frequently and cross-sectional variation only is insufficient to catch the true effect of institutions. Second, there are many country specific events that may affect unemployment but which cannot all be taken into account. Examples of such events are the German unification, the large growth of part-time labor in the Netherlands, the big EU subsidies for Ireland and the loss

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<sup>1</sup>See Nickell and Layard (1999) for a general overview of the relationships between unemployment and labor market institutions.

of Eastern Europe exports for Finland.<sup>2</sup> Despite these drawbacks we think that our dataset is sufficiently rich to establish the nature of the interactions between institutions.

The paper is structured as follows. In section 2, we present a theoretical model of employment and wage determination. In section 3, we discuss the labor market performances of OECD countries and relate these in a stylized way to labor market institutions. In section 4, we present our empirical analysis based on information from eighteen OECD countries, over the period 1960-1995. Because we are interested in long term effects we use averages over periods of five years. In section 5 we conclude.

## 2 Theoretical background and related studies

### 2.1 Theoretical background

We use a simple model capturing the effects of labor market institutions on the unemployment rate.<sup>3</sup> Our model is based on Layard and Nickell (1997), Bean (1994) and Scarpetta (1996). The labor market is imperfectly competitive since wages are determined by a bargaining process between representatives of the employees and the employers. The commodity market is also imperfect. The firms face exogenously determined product market conditions and their capital and technology is also predetermined.

We consider a simple right-to-manage model where nominal gross wages are determined by a bargaining process. The firms then choose employment so as to maximize their profits. While unemployed, workers search for a job with an intensity that may depend on the replacement rate ( $\frac{1}{2}$ ). Finally, at each period, there is a positive probability of separation.

Within this framework labor demand ( $n$ ) is a function of real wages ( $w/p$ ), where  $w$  stands for the gross wage and  $p$  for the price level, both taken in logarithms; and a function of other "push" institutional factors ( $Z_n$ ) such as

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<sup>2</sup>Nickell and Van Ours (2000a, 2000b) give an explanation of the success of The Netherlands and UK in reducing unemployment. They use the results from Scarpetta (1996), Elmeskov et al. (1998) and Nickell and Layard (1999) to indicate the quantitative impact of institutional changes on the equilibrium unemployment rates in the Netherlands and the UK. They conclude that much of the recent decline in equilibrium unemployment in both countries is due to a combination of changes in the wage bargaining structures, the tax benefit system and active labor market policies.

<sup>3</sup>In a companion paper, Belot and Van Ours (2000), we present a more detailed theoretical model.

payroll taxes, employment protection and active labor market policy.

$$n = \beta(w - p) - \alpha_n Z_n; \quad \text{with } \beta > 0; \quad (1)$$

The wage-setting schedule depends on institutional factors ( $Z_w$ ) that determine the bargaining position of the relative players. Workers have a better bargaining position when unemployment benefits and union density are high. Workers are more willing to concede wage increases when the employment protection is strong. The structure of the bargaining system may also play a role. There is a negative relationship between unemployment  $u$  and wages. The intuition is that a higher unemployment rate weakens the bargaining position of the workers. Finally, wages are bargained on the basis of the expected prices  $p_e$ . If the actual prices  $p$  differ from the expectations, the net wage will be affected.

$$w = \alpha_w Z_w + \alpha_u u + \alpha_p p_e + (1 - \alpha_p)p; \quad (2)$$

where  $\alpha_p$  indicates to what extent nominal wages respond to expected or to realized prices. That is because nominal wages will be fixed prior to the period when the prices are revealed<sup>4</sup>. Therefore the real wage is equal to

$$w - p = \alpha_w Z_w + \alpha_u u + \alpha_p (p_e - p); \quad (3)$$

If we assume that price surprises ( $p - p_e$ ) are synonymous with changes in inflation ( $\Phi^2 p$ ), we find

$$w - p = \alpha_w Z_w + \alpha_u u + \alpha_p \Phi^2 p; \quad (4)$$

We assume that the labor supply decision depends on factors affecting participating decisions ( $Z_p$ ) and factors pushing the wages up (indirect participating effects)  $Z_w$ :

$$l = \alpha_p Z_p + \alpha_w Z_w; \quad (5)$$

Unemployment is equal to the difference between the labor supply ( $l$ ) and the employment ( $n$ ).

$$u = l - n; \quad (6)$$

Substituting for  $l$ ,  $n$  and  $w$  :

$$u = \alpha_p Z_p + \alpha_w Z_w + \beta(\alpha_w Z_w + \alpha_u u + \alpha_p \Phi^2 p) + \alpha_n Z_n; \quad (7)$$

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<sup>4</sup>If nominal wages react immediately to prices,  $\alpha_p$  will be zero.

The unemployment equation is therefore:

$$u = \frac{\bar{p}Z_p + \bar{n}Z_n + (\bar{\pi} + 1)\bar{w}Z_w + \bar{\pi}^2\bar{p}}{1 + \bar{\pi}^2}; \quad (8)$$

which we rewrite as

$$u = \bar{Z}_j + \bar{\pi}^2\bar{p} \quad (9)$$

where the subscript  $j$  refers to the type of labor market institution and  $\bar{\pi} < 0$ . Equation (11) indicates that the level of unemployment depends on labor market institutions and the change in inflation. The equilibrium level of unemployment ( $\bar{\pi}^2\bar{p} = 0$ ) only depends on labor market institutions.

## 2.2 Related studies

Nickell (1997 and 1998) constitutes a starting point to our empirical study. Nickell (1997) considers 20 OECD countries taking averages over two time periods : 1983-8 and 1989-94. From his analysis, he concludes that financial incentives for unemployed such as the replacement rate and benefit duration affect unemployment. Active labor market policies affect unemployment and characteristics of the wage determination system also play a significant role. Union density and union coverage are pushing the unemployment rate upwards. On the other hand, coordination between unions and employers stimulate labor market performance. Finally, labor taxes increase total unemployment, while none of the indicators of labor market rigidity (employment protection regulation, labor taxes) has a significant effect. In the 1998 study, Nickell includes the owner occupation rate as additional regressor. The coefficients related to the other variables are however barely different from the ones on the 1997 study.

Scarpetta (1996) considers 15 to 17 OECD countries over the 1983-1993 period focusing on the OECD structural unemployment rate. The main conclusion is that institutions matter and play an important role in the persistence of unemployment. In a dynamic formulation of the model Scarpetta adds variables such as the terms of trade, assumed to play an important role in small open economies. For the rest, the variables taken into consideration are quite similar to the ones used by Nickell. Scarpetta finds different results however, with respect to labor taxes (no significant effect) and the employment protection regulation (significant positive effect). The latter result also contrasts with Bertola (1992) who was also unable to find any relationship between unemployment levels and employment adjustment costs. Further, Scarpetta finds support for the hump-shape

hypothesis associated with the degree of centralization (Calmfors and Driemel, 1988). Interest rates and terms of trade do not have any significant effect on long run labor market conditions. Regarding the role of institutions on the persistence of unemployment, Scarpetta finds that generous unemployment benefits, employment protection and high degree of unionization extend the adjustment period.

Elmeskov, Martin and Scarpetta (1998) extend the previous analysis by considering a larger number of countries, taking the recent institutional developments into account (in particular, evolutions of collective bargaining structures and employment protection legislation) and testing the existence of potential interactions between policies or institutional factors. The main conclusion is that successful countries might owe their success to reforms directed at insiders. In particular, the tightening of eligibility conditions and the reduction of unemployment benefits, as well as the easing up of fixed term contracts regulation might have had a determinant influence. The authors build a new indicator characterizing the wage setting system, summarizing the degree of centralization and the degree of coordination. Assuming that in countries where the degree of centralization is medium (negotiations mainly at the industry level), coordination among actors might be particularly crucial, they upgrade countries with medium level of centralization and high degree of coordination. Elmeskov et al. also find empirical support for the interaction effects hypothesis. First, the average tax wedge and the employment protection regulation push the structural unemployment rate at a higher level in countries with intermediary level of corporatism. Further, unemployment benefits are likely to have a higher effect in countries with relatively high levels of active labor market policy expenditures. And it appears that the degree of employment protection does not matter for the effect of unemployment benefits, while they would have expected the effect of unemployment benefit to be higher in countries with high employment protection, the bargaining power of the workers assumed to be bigger.

Finally, Daveri and Tabellini (1997) look at complementarities between labor taxes and the nature of collective arrangements. Their analysis concerns 14 countries over the period 1965-1991. They find empirical support for a correlation between the negative effect of labor taxes on labor market performances and the nature of organization of the workers. Decentralized or centralized countries have lower unemployment rates, irrespective of the level of labor taxes.

## 2.3 Interactions

The basic argument of this paper is that the role of each institution depends on the rest of the institutional framework. Hence, the effect of an institutional reform might produce different effects according to the other institutions present. There are multiple mechanisms by which institutions might interact with each other. Calmfors (1993) shows how in theory the effect of taxes differ according to nature of the bargaining institutions. Coe and Snower (1997) investigate the channels through which labor market institutions could interact with each other. One example of a channel is the interdependence between the search intensities of the workers and employers, looking for each other on the labor market. Hence, the unemployment benefit system gives less incentives to the workers to look for a job and therefore discourages vacancy posting. Another institution, such as the employment protection legislation, discourages vacancy posting and so reduces the search intensity of the workers since the likelihood of finding a job is smaller. Hence, the presence of both institutions (unemployment benefits and employment protection) in the same time amplifies their respective effect on the unemployment rate. In the same line of reasoning, they also claim that "the more generous are passive unemployment policies, the less effective will be the active unemployment policies". Fitoussi et. al. (1998) underline that all recently successful countries have in common the implementation of a set of comprehensive reforms. Blanchard and Wolfers (2000) show that institutions and shocks interact with each other. Hence, they argue that similar shocks can have very different effect on the unemployment, depending on the labor market institutions.

We distinguish between interactions within the system of financial incentives, labor taxes and unemployment benefits and interactions within the structure of union bargaining, with indicators union density, level of bargaining and employment protection.

The essence of the interaction is that the effect of one institutional parameter may depend on the value of other parameters. Labor taxes for example weaken the bargaining position of the workers. However, they are linked positively with the unemployment benefits, through a social security budget constraint. Hence, in general, when unemployment benefits are generous, tax rates are high. The similar holds for the interactions between the characteristics of the bargaining system. Union density should according to our predictions have a more damaging effect in systems where unions have a favorable bargaining position, such as decentralized and uncoordinated economies.

Of course, there can also be interactions between the two sets of institutions. The effects of changes in replacement rates and labor taxes may depend on the



structure of the bargaining system. Calmfors (1993) and Elmeskov et al. (1999) argue for example that the effect of taxes should differ according to the degree of corporatism. Hence, the effect of taxes on unemployment would be stronger in medium-centralized economies. Daveri and Tabellini (1997) argue that these economies are characterized by a high insider power such that workers are able to resist the transfer of the tax burden on labor. In highly centralized economies, unions take into account the effect of such a behavior on the outsiders, i.e. since labor demand decreases when employers bear the burden of payroll taxes, the unemployment would be higher.

### 3 Stylized facts on institutions

In our analysis we use data of 18 industrial countries over the period 1960-1994, which we group into 7 five years periods to remove the effect of cyclical fluctuations. Table 2 shows that averaged over the countries involved the unemployment rate steadily increases from the early 1960s to the early 1990s, to decrease somewhat in the late 1990s.

Our data cover a period of 35 years. Unfortunately, some labor market institutions cannot be included in our analysis because there is only recent information about them. The most important of these institutions are the minimum wage, active labor market policies and financial incentives for unemployed other than the replacement rate.<sup>5</sup> These other institutions refer to benefit durations and benefit sanctions. Longer benefit durations induce workers to search less intensive. Benefit sanctions are a recent phenomenon. Workers that collect unemployment benefits have to comply with administrative rules. In many countries to remain eligible for unemployment benefits, workers have to be available to start work at short notice, they have to provide proof of job search efforts (e.g. recent job applications), they are not allowed to reject job offers too easily and they have to attend interviews and training courses as required by the public employment services.<sup>6</sup> These eligibility criteria may be enforced by imposing benefit sanctions.<sup>7</sup>

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<sup>5</sup>Another variable is the home ownership rate. As discussed before, Nickell (1998) included this variable while Nickell (1997) did not. Nevertheless, the parameter estimates were very similar. We introduce home ownership rate in our sensitivity analysis below and find similar results.

<sup>6</sup>These eligibility criteria refer to behavior during benefit periods. Apart from that, many countries also have criteria with respect to the behavior before benefits starts, especially with respect to efforts to prevent job loss.

<sup>7</sup>See Grubb (1999) for details on the system of benefit sanctions in various countries and Boone and Van Ours (2000) for an overview of potential effects of benefit sanctions.

Table 2 shows that the average replacement rate has increased substantially in the 1970s. Whereas averaged over the countries the replacement rate in the late 1960s was 17.0 percent, in the early 1990 this was 27.5 percent. Taxes have also increased from 26.8% in the late 1960s to 39.4% in the early 1990s.

Table 2 also shows that union density on average over the countries did not change a lot in the past decades. Employment protection has decreased since the mid 1980s.

## 4 Empirical analysis

### 4.1 Set-up of the analysis

Our empirical analysis is based on the relationship we derived in the theoretical section to which we add subscripts for time period and country and error terms. Furthermore, we generalize the effect of labor market institutions to allow for interactions:

$$u_{i,t} = \alpha_i + \alpha_t + \beta Z_{i,t} + \gamma p_{i,t} + \epsilon_{i,t} \quad (10)$$

where  $u$  is the unemployment rate,  $Z$  refers to labor market institutions,  $p$  is the price level, the index  $i$  refers to the country and the index  $t$  refers to the 5-years time periods. Note that interactions between labor market institutions may be included in  $Z$ . Furthermore, the  $\alpha_i$  s are country fixed effects, the  $\alpha_t$  are time period fixed effects, the vector  $\beta$  and  $\gamma$  represent coefficients of interest and  $\epsilon$  is an error term that is i.i.d.

We are interested in the direct effects of institutions on unemployment, but also in possible interactions. We consider the interaction between the two indicators for financial incentives, taxes and replacement rate, and the interaction between the union bargaining institutions, union density, employment protection and the level of bargaining in more detail.

### 4.2 Parameter estimates

The first column of the upper part of Table 3 presents the estimation results if we do not include country fixed effects nor time period fixed effects. Then, we find that the unemployment rate is positively influenced by taxes, replacement rates and union density. Employment protection and centralization have a negative influence on unemployment. The effects are straightforward. A 10%-point

higher tax rate is related to a 1.2%-point higher unemployment rate. A 10%-point higher replacement rate is related to a 0.7%-point higher unemployment rate. Employment protection is a variable that ranges from 0 to 1. Therefore, these estimation results would imply that the difference in unemployment rate caused by employment protection is at most 3%-points. A 10%-point increase in union density is related to a 0.6%-point increase in the unemployment rate. Finally, since the centralization variable ranges from 1 to 3, the unemployment rate under a system of firm bargaining is 5%-points higher than it is under centralized bargaining. The effect of the change in inflation is significantly negative, according to our expectations.

The parameter estimates in the first column are based on a mixture of cross-sectional and time series variation. To investigate to what extent changes in labor market institutions are responsible for the evolution of unemployment rates, we introduce both period fixed effects and country fixed effects. The second column of the upper part of Table 3 shows the new parameter estimates. Now, none of the labor market institutions has a significant effect on the unemployment rate. The coefficient of the change in inflation is hardly affected by the introduction of the fixed effects. The results with respect to the relationship between labor market institutions and unemployment in the first column seem to be caused by fixed differences between countries and time periods and not by within country changes in labor market institutions. However, so far we only accounted for direct effects of institutions on unemployment.

The lower part of Table 3 shows what happens if we allow for interactions between labor market institutions. Since the replacement rate and the tax rate are continuous variables we directly introduce an interaction term. Our centralization variable is to a large extent discrete. Therefore, we consider interaction by investigating the effect of employment protection and union density for different bargaining regimes. As shown in the first column in the lower part of Table 3, there is a positive interaction between the tax rate and the replacement rate. The effect of the replacement rate on the unemployment rate is larger when taxes are high. Of the coefficients on employment protection, allowed to be different for each bargaining regime, only the one at the decentralized bargaining level differs significantly from zero. The relationship between union density and unemployment rate also depends on the bargaining structure. When there is decentralized bargaining an increase in union density causes unemployment rate to increase. When there is industry level or centralized bargaining there is no relationship between union density and unemployment.

In the second column of the lower part of Table 3 it is shown that the pa-

parameter estimates hardly change if we omit the insignificant coefficients. The estimation results presented imply that the effect of the replacement rate ( $\frac{1}{2}$ ) on the unemployment rate depends on the tax rate ( $\zeta$ ) and vice versa. For the effect of replacement rate on unemployment we have  $\frac{\partial U}{\partial \frac{1}{2}} = -0.21 + 0.51\zeta$ . So, it seems like as if only at high tax rates an increase in the replacement rate increases unemployment. For the effect of the tax rate on unemployment rate we have  $\frac{\partial U}{\partial \zeta} = 0.51b$ ; which implies that the effect on unemployment of a reduction in tax rates is larger if the replacement rate is higher. Employment protection and union density only have an effect under a system of decentralized bargaining. If there is such a system, more employment protection reduces unemployment, a higher union density increases unemployment.

### 4.3 Sensitivity analysis

In this subsection we present the results of a simple sensitivity analyses by introducing home ownership rate as an additional explanatory variable. This variable has been advocated by Oswald (1997, 1999) as an explanation for the rise in unemployment in many European countries. A high home ownership rate may be responsible for a high unemployment rate because homeowners are relatively immobile.

The third column in the upper part of Table 3 shows that if we only consider direct effects of institutions the home ownership variable has a significant positive effect on unemployment even if we allow for country fixed effects and time period fixed effects. If we introduce the home ownership rate in the estimates where we allow for interactions between institutions we also find a significant positive effect. However, as shown in the third column of the lower part of Table 3 the introduction of the home ownership variable hardly affects the other parameter estimates. From this we conclude that home ownership rates may be a determinant of unemployment rates, but this is additional to the effects of traditional labor market institutions. Finally, the fourth column of the lower part of Table 3 shows what happens to the parameter estimates if we omit the country fixed effects and the calendar time fixed effects. In this case we still find positive effects of the tax rate and the replacement rate although the effect of the interaction between the two is vanished. We also still find an effect of employment protection and union density, both under a system of decentralized bargaining. The home ownership rate has a similar effect as before.

## 5 Conclusions

There is an obvious difference in labor market performance between OECD countries in particular in terms of the evolution of unemployment rates. The main question we address in this paper is to what extent labor market institutions are responsible for this. We investigate the relationship between unemployment rate and labor market institutions in particular tax rate, replacement rate, employment protection, union density, level of bargaining. We investigate both the direct effects of institutions and interactions between them. Our empirical analysis shows that interaction effects are important.

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## 6 Data appendix

### 6.1 Definition and sources

- Change in inflation: Absolute annual change in inflation, the latter defined as the relative increase in consumer prices. Source: Consumer price index, Luxembourg Income Study.
- Tax rate: Employment tax rate + Direct tax rate.
- Employment tax rate: Indicator previously computed by the Centre for Economic Performance (London School of Economics), defined as the ratio between the sum of employers' contributions to social security contributions and contributions to private pension schemes (when applicable) and the compensation of employees net of these contributions. Source: CEP (1960-1992), OECD, National Accounts (1993-1996).
- Direct tax rate: Indicator previously computed by the Centre for Economic Performance (London School of Economics), defined as the ratio between the sum of households' contributions to social security net the employers' contributions and the income taxes, and the households' current receipts. Source: CEP (1960-1992), OECD, National Accounts (1993-1996).
- Replacement rate: Ratio between the unemployment benefit and the median wage. The indicator used for the unemployment benefit is a summary indicator, taking into account various durations and family situations. The ratio has been directly computed by OECD. Only odd years were available. We have computed even years by linear interpolation.
- Employment protection: Built index indicating the strictness of employment regulation with respect to open-ended contracts, fixed-term (FT) contracts and temporary work agencies (TWA). See below.
- Centralization index: Index (1-3) characterizing the degree of centralization of the collective bargaining system, according to the privileged level of bargaining: 1:firm level, 2:industry level, 3:national level. Source: Bratt (1996), OECD, Employment Outlook (1997), Elmeskov et al. (1997). Some countries have changed bargaining regime in the period of analysis. On an annual basis this is a discrete jump between 1, 2 or 3. However, because we use five years periods the value of the centralization variable may be between two discrete values. If that was the case we rounded the value to 1, 2 or 3.
- Union density: union density using OECD data, source CEP.
- Home ownership: from Blanchflower and Oswald who have 10 years intervals, which we transferred to 5 years intervals through interpolation.



The mean, minimum and maximum values and the standard deviation of the variables are:

	Mean	Minimum	Maximum	Standard dev.
u	0.05	0.00	0.17	0.04
$\Phi^2p$	0.02	-3.90	3.60	1.07
Tax rate	0.33	0.06	0.58	0.12
Replacement rate	0.22	0.00	0.63	0.14
Employment protection	0.43	0	1	0.29
Union density	0.45	0.09	0.87	0.16
Centralization	1.94	1	3	0.64
Home ownership	0.53	0.28	0.81	0.13

## 6.2 Key for the building of the employment protection indicator

### 6.2.1 Protection of open-ended contracts

#### Administrative procedure

The marks are added up according to the presence of the mentioned factors.

- 1 - Noti...cation required (verbally or by letter)
- 1 - Grounds noti...cation required (verbally or by letter)
- 1 - Noti...cation to a third party required
- 2 - Authorization of a third party

#### Noticing period

- 0 - No noti...cation period required
- 1 - < 2 months
- 2 - > 2 months

#### Severance payment

- 0 - No noti...cation period required
- 1 - < 2 months
- 2 - > 2 months

#### Special provisions

- 1 - Tighter protection of special categories of workers
- 2 - Companies must provide retraining courses

#### De...nition of unfair dismissals (and provisions with respect to it)

- 0 - Discrimination and no economic grounds
- 1 - when social considerations haven't been taken into account
- 1 - when discrimination in the selection procedure of dismissals

- 1 - when no consultation with the workforce has been undertaken
- 2 - when re-training the labor force must be attempted
- 3 - when worker capability cannot be a basis for dismissal
- 1 - when a ceiling apply to appeal against unfair dismissal

#### Collective dismissals (special provisions)

- 1 - Conciliation with workforce / third party required
- 1 - redundancies must be accompanied by a social plan
- 2 - authorization of a third party required
- 2 - when speci...c conditions must be ful...lled

### 6.2.2 Regulation of ...xed-term contracts

#### Purpose

- 0 - No limit
- 1 - Speci...c restrictions (some jobs ore sectors are excluded)
- 2 - Particular circumstances (increase in the amount of work, temporary re-  
placement of a worker)
- 2 - Wide restrictions (limited to some jobs or sectors)
- 3 - Objective reasons (task temporary in nature)
- 4 - Not allowed
- 1 - If can be used for unemployed and apprentices (if restrictions exist oth-  
erwise)

#### Duration

- 0 - No limit
- 1 - Limited to 1 year, only few renewals possible
- 2 - no renewal possible

### 6.2.3 Temporary work agencies regulation

#### Purpose

- 0 - No limit
- 1 - Speci...c restrictions (some jobs ore sectors are excluded)
- 2 - Particular circumstances (increase in the amount of work, temporary re-  
placement of a worker)
- 2 - Wide restrictions (limited to some jobs or sectors)
- 3 - Objective reasons (task temporary in nature)
- 4 - Not allowed
- 1 - If can be used for unemployed and apprentices (if restrictions exist oth-  
erwise)

#### Duration

- 0 - No limit
- 1 - Limited to 1 year, only few renewals possible
- 2 - no renewal possible

We graded the evolution of the employment regulation for all the countries, over the period 1960-1996 . We then calculated three indicators, averaging the grades related to each component described above. We normalized the highest value for each indicator to 1, so as to re-scale our indicators in a range [0,1]. We then calculated the average of the three indicators to obtain the summary index of employment protection

Table 1 Unemployment rates by time period<sup>a)</sup>

	1960/64 (1)	1980/84 (2)	1995/99 (3)	(2)-(1)	(3)-(2)
Australia	2.6	7.4	8.1	4.7	0.7
Austria	2.2	3.2	4.2	1.0	1.1
Belgium	2.2	11.5	9.3	9.3	-2.2
Canada	5.6	9.8	8.9	4.2	-1.0
Denmark	1.8	9.7	6.4	7.9	-3.3
Finland	1.4	5.2	13.4	3.9	8.2
France	1.4	8.2	11.9	6.8	3.7
Germany	0.7	6.1	9.0	5.4	2.9
Ireland	5.0	11.8	9.6	6.8	-2.2
Italy	5.1	8.8	11.9	3.7	3.1
Japan	1.4	2.4	3.7	1.0	1.3
Netherlands	1.1	10.1	5.1	9.0	-5.0
Norway	1.1	2.6	4.1	1.5	1.5
New Zealand	0.1	4.2	6.7	4.1	2.5
Sweden	1.6	2.8	8.9	1.3	6.1
Switzerland	0.0	0.6	4.8	0.5	4.2
United Kingdom	1.5	9.6	7.3	8.1	-2.3
United States	5.7	8.3	4.9	2.6	-3.4

<sup>a)</sup> The numbers refer to 5 years averages

Table 2 Five years averages over countries for different time periods

	Unempl. rate (%)	Union density (%)	Repl. rate (%)	Tax rate (%)	Empl. prot. (%)
1960/64	2.3	43.6	16.2	23.1	43.2
1965/69	2.2	43.7	17.0	26.8	43.4
1970/74	2.6	44.4	19.6	31.3	44.3
1975/79	4.5	46.3	24.0	35.4	44.4
1980/84	6.8	47.3	25.7	37.3	44.2
1985/89	7.1	44.7	27.1	38.6	40.4
1990/94	8.1	42.6	27.5	39.4	39.7
1995/99	7.7				

Table 3 Estimation results<sup>a)</sup>

## a. direct effects

	(1)	(2)	(3)
Tax rate ( $\zeta$ )	0.12 (4.1) <sup>***</sup>	0.03 (0.4)	-0.07 (1.0)
Replacement rate ( $\frac{1}{2}$ )	0.71 (4.1) <sup>***</sup>	0.05 (0.2)	-0.04 (0.2)
Employment protection	-0.34 (3.0) <sup>***</sup>	-0.10 (0.3)	-0.16 (0.5)
Union density	0.59 (2.8) <sup>***</sup>	0.11 (0.3)	-0.11 (0.3)
Centralization	-0.26 (6.1) <sup>***</sup>	-0.08 (1.1)	-0.12 (1.4)
Home ownership	-	-	0.19 (4.2) <sup>***</sup>
$\Phi^2p$ (%)	-0.69 (2.7) <sup>***</sup>	-0.63 (2.6) <sup>***</sup>	-0.51 (2.2) <sup>***</sup>
$\bar{R}^2$	0.394	0.781	0.817
Fixed effects	no	yes	yes

## b. direct effects and interactions

Direct effects	(1)	(2)	(3)	(4)
Tax rate ( $\zeta$ )	-0.08 (1.0)	-	-	0.11 (3.2) <sup>***</sup>
Replacement rate ( $\frac{1}{2}$ )	-2.14 (3.5) <sup>***</sup>	-2.07 (4.1) <sup>***</sup>	-1.92 (3.9) <sup>***</sup>	1.09 (1.8) <sup>*</sup>
Home ownership	-	-	0.14 (3.8) <sup>***</sup>	0.16 (7.0) <sup>***</sup>
Interactions				
$\zeta:\frac{1}{2}$	5.46 (3.5) <sup>***</sup>	5.12 (4.5) <sup>***</sup>	4.79 (4.6) <sup>***</sup>	-0.76 (0.5)
Empl. protectionjcen=1	-0.75 (2.0) <sup>***</sup>	-1.20 (4.2) <sup>***</sup>	-0.88 (2.7) <sup>***</sup>	-0.47 (4.6) <sup>***</sup>
Empl. protectionjcen=2	0.61 (1.7)	-	-	-
Empl. protectionjcen=3	0.56 (0.9)	-	-	-
Union densityjcen=1	1.68 (3.8) <sup>***</sup>	1.57 (4.2) <sup>***</sup>	1.16 (2.9) <sup>***</sup>	1.00 (4.2) <sup>***</sup>
Union densityjcen=2	0.11 (0.3)	-	-	-
Union densityjcen=3	0.04 (0.1)	-	-	-
$\Phi^2p$ (%)	-0.57 (2.3) <sup>***</sup>	-0.54 (2.2) <sup>***</sup>	-0.48 (2.3) <sup>***</sup>	-0.58 (2.7) <sup>***</sup>
$\bar{R}^2$	0.835	0.832	0.849	0.597
Fixed effects	yes	yes	yes	no

<sup>a)</sup> The estimates are based on 119 observations; absolute t-values (based on heteroskedastic-consistent standard errors) in parentheses. The coefficients of the replacement rate, employment protection, union density and centralization should be divided by 10. \* (\*\*\*) = significantly different from zero at 10% (5%) level